

AgSTAR National Conference

March 24-25, 2004

Covered Lagoons

(Anaerobic Digester-Ambient Temperature)



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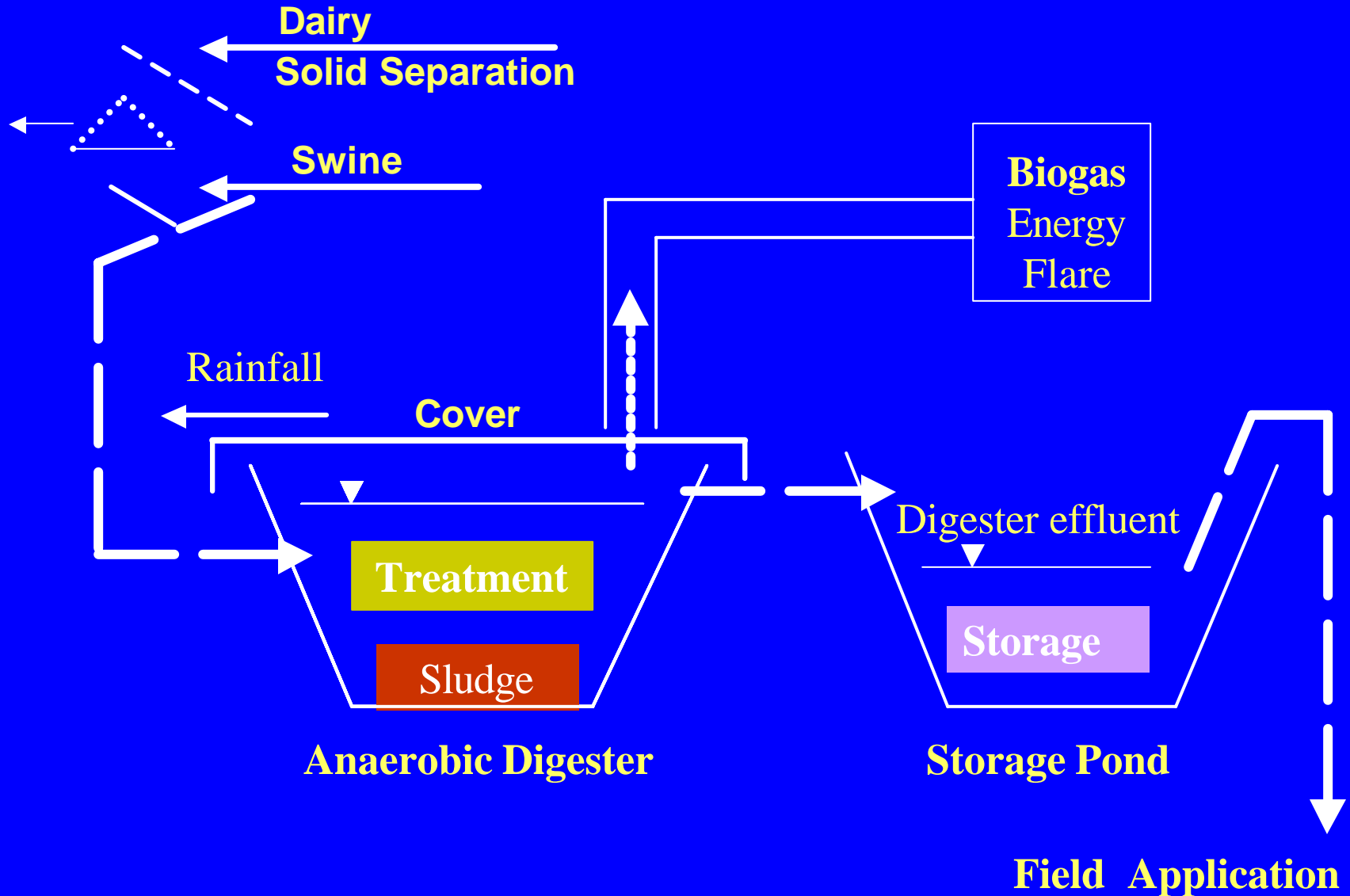


Air Quality Issues:
Odors
Greenhouse Gas



Water Quality
Renewable Energy

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Digester Characteristics

- Loading Rate (NRCS – VS/1000 cu.ft.)
- Low Solids influent (NRCS < 2% TS)
 - Dairy Manure – requires solids separation pre-treat
 - Swine Manure – ideal for flush and pit recharge
- Ambient Temperature (NRCS – 40th parallel)
 - Large volume, in ground digester
 - Temperature of digester similar to ground temperature (AgSTAR software)

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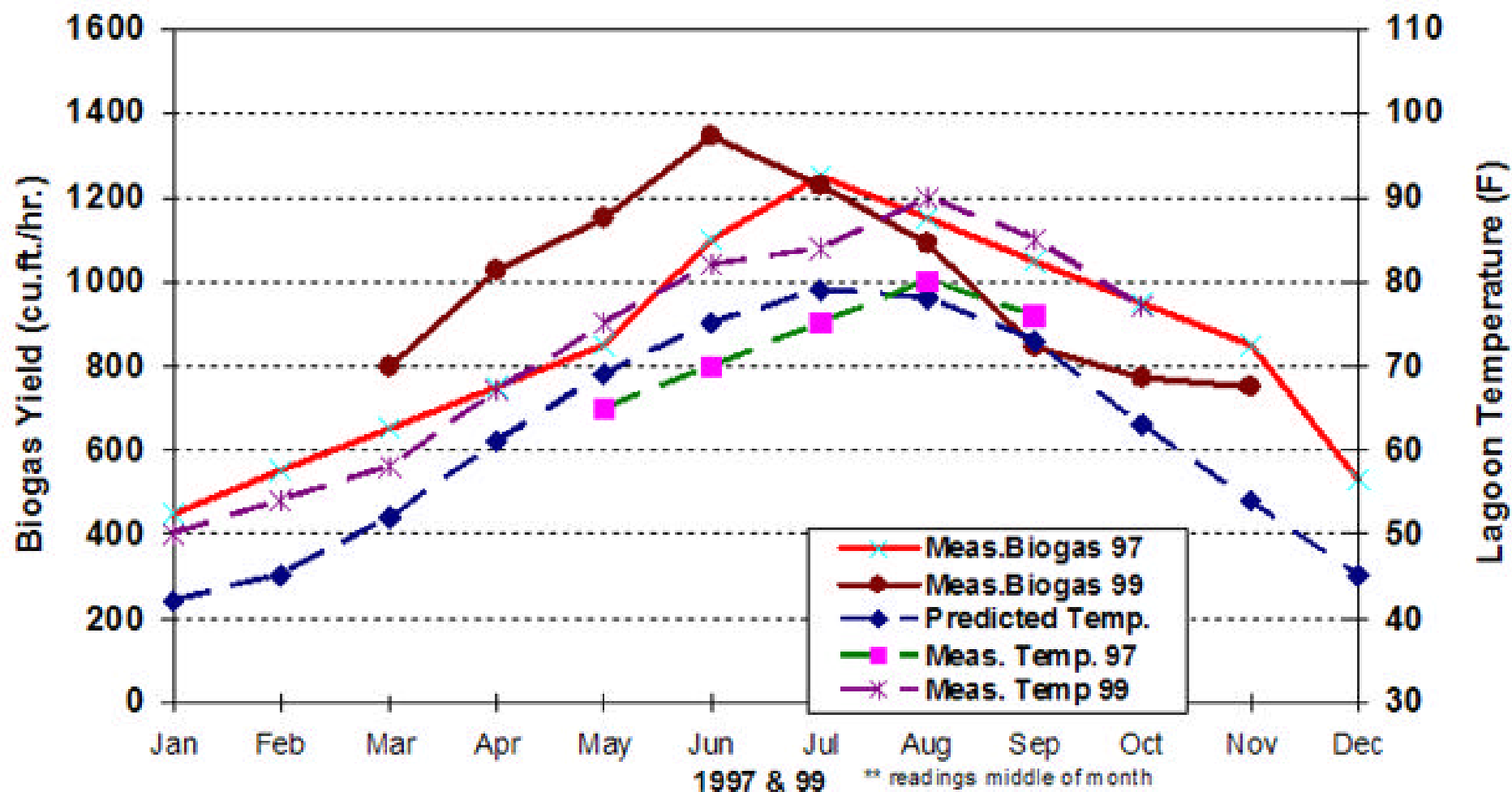


Digester Characteristics

- Relatively Large Surface Area
 - Location/soils/water table
 - Rainfall
 - Cost of cover
- Biogas Yield Varies
 - Biogas yield is temperature dependent
 - High in warm months
 - Low in winter months

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Digester Characteristics



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Digester

Partial cover

- **Odor reduction**
- **Initial cost (?)**
- **No gas storage**
- **Not recommended for high rainfall areas**
- **High operation & maintenance**
- **Rainwater into digester**
- **Service Life (NRCS PS – 10 yr. min.)**

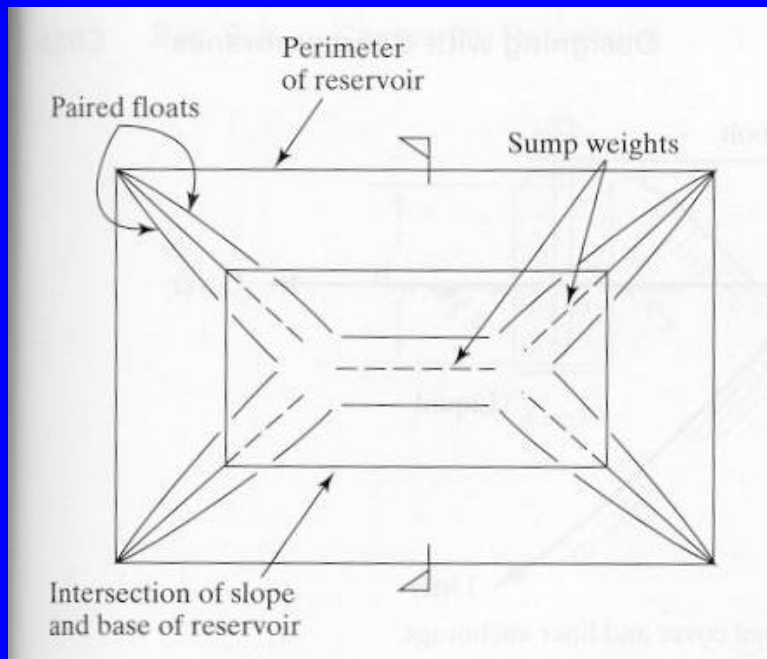


Digester **Bank to Bank Cover**

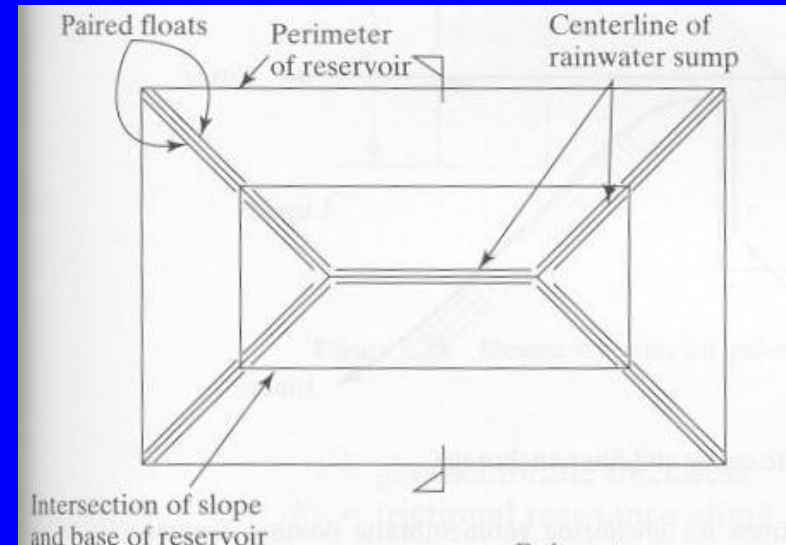
- **Rainwater exclusion**
- **Low operation & maintenance**
- **Effective gas storage**
- **No emissions**
- **High rainfall**
- **Service Life**



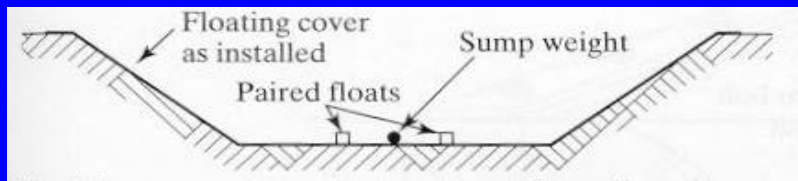
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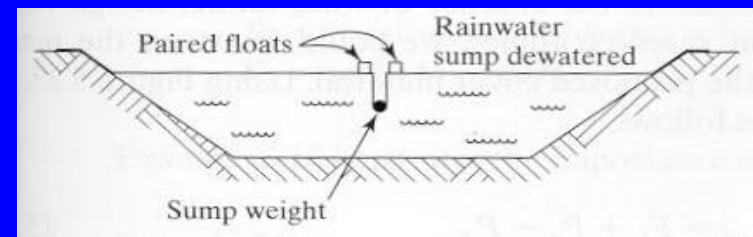
Plan of Cover – empty



Plan of Cover – operating level



Cross Section – pond empty



Cross Section – operating level

Cover Design Reference: Designing with Geosynthetics by Koerner

Gas Collection/Control

- Perforated Pipe - perimeter
- Operating water line
- Secure pipe
- 10 yr Service Life under cover (NRCS)
- Gas Control – Blower
- Monitor

Gas Collection



Picture courtesy of EFI

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Gas Control



Current Status covered digesters:

CA - 5 +

UT - 5 *

WI - 3

NC - 3

TX - 3

WY - 2

MS - 1 *

IL - 1

Total 23 +/-

Covered Lagoon – Case Study

- 4000 sow - farrow to wean
- 4 gestation barns
- 2 farrowing barns
- slatted floors (grates)
- shallow pit/recharge
- flush pit 4/8 day cycle
- waste gravity flow



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partial cover - 1997

material Failure

design deficiencies

bank to bank - 1998

- **rain exclusion**
- **no emissions (sealed)**
- **biogas storage**
- **low maintenance**



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1998 to 2003
Demonstrated:
Energy Resource!
Reduced Emissions!
Marketable Produce!
Reduced Acreage!
Manageable!
Economics ?

